WATER RESOURCES REVIEW for

MAY 1975

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH

STREAMFLOW AND GROUND–WATER CONDITIONS

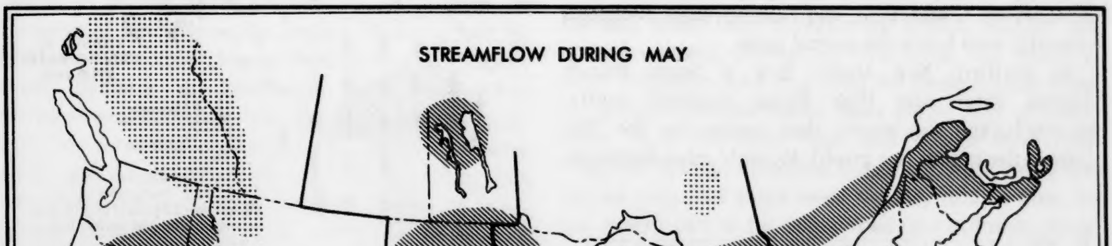
Streamflow increased in most of southern Canada and in some eastern, southern, and western States, and Alaska, but generally decreased in the central States and Hawaii.

Below-normal flows persisted in parts of Alberta, British Columbia, and Ontario in Canada, in several western States, and in parts of Alaska and Florida.

Record-low monthly and daily mean discharges occurred on several streams in mountainous areas of the western States as snowmelt runoff continued to be delayed by below-normal temperatures.

Flooding occurred in parts of Alaska, Illinois, Louisiana, North Carolina, Oklahoma, and Texas.

The monthly mean flow of 1,412,000 cfs in the lower Mississippi River system (Atchafalaya and Mississippi Rivers) was 40 percent greater than average and the 4th highest for May since the combined records began in 1935.



NORTHEAST

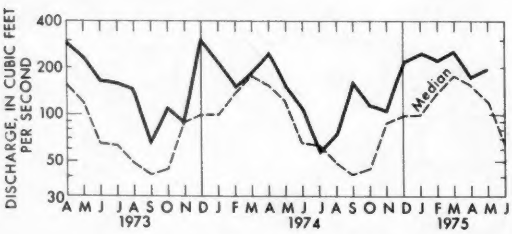
[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

STREAMFLOW GENERALLY DECREASED SEASONALLY IN THE SOUTHERN NEW ENGLAND STATES AND NEW YORK, GENERALLY INCREASED IN MARYLAND, NEW JERSEY, AND QUEBEC, AND WAS VARIABLE ELSEWHERE IN THE REGION.

In southern Quebec and northern parts of New Brunswick, Nova Scotia, and Maine, where streamflow during April generally was below the normal range as a result of delayed snowmelt runoff, monthly mean discharges increased sharply in May and were in the above-normal range. For example, at the index station Upsalquitch River at Upsalquitch, in northern New Brunswick, the increase in monthly mean flow from April to May was more than 5 times normal.

In the east-central part of the region, streamflow decreased seasonally in Massachusetts, Rhode Island, and the adjacent areas of southern New Hampshire and northeastern Connecticut, and monthly mean discharges generally were below the normal range.

In northern New Jersey, flow of South Branch Raritan River near High Bridge increased contraseasonally and was greater than median for the 10th consecutive month (see graph). Monthly mean discharges



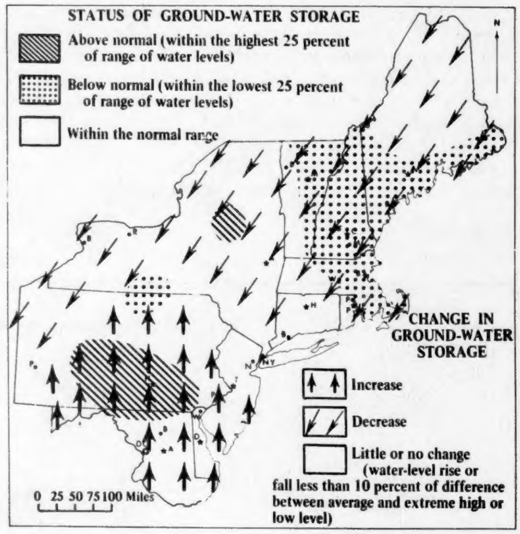
Monthly mean discharge of South Branch Raritan River near High Bridge, N.J. (Drainage area, 65.3 sq mi; 169.1 sq km)

have been in the above-normal range in 7 of the past 9 months at that index station.

In the southern part of the region, monthly mean flows also increased contraseasonally and were above the normal range in the bi-State area of Delaware and Maryland. In eastern Maryland, flow at the index station Choptank River near Greensboro, has averaged about twice median for the past 6 months.

In New York, and the adjacent areas of Vermont and southern Quebec (south of St. Lawrence River), monthly mean flows decreased seasonally but were greater than median at all index stations. In extreme northwestern Pennsylvania, monthly mean discharge of Oil Creek at Rouseville also decreased seasonally but remained far below median for the 2d consecutive month.

Ground-water levels declined in most of New York and the New England States; and rose in central and southern Pennsylvania, much of southern New Jersey, and in most of Delaware and Maryland (see map). Monthend levels were below average in much of central New England and southern Maine; and were generally near average elsewhere except for above-average levels in south-central Pennsylvania.



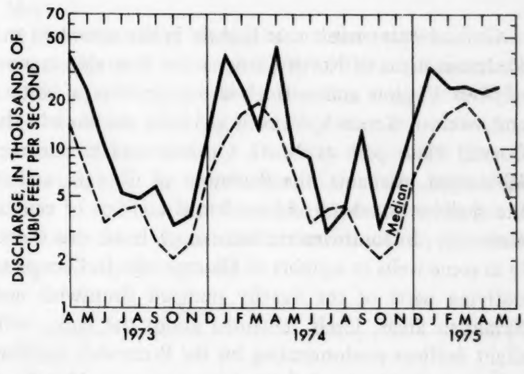
Map above shows ground-water storage near end of May and change in ground-water storage from end of April to end of May.

SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

STREAMFLOW WAS ABOVE THE NORMAL RANGE IN PARTS OF ALL STATES OF THE REGION EXCEPT ALABAMA, KENTUCKY, AND VIRGINIA. FLOWS INCREASED CONTRASEASONALLY IN PARTS OF SOUTHERN FLORIDA BUT REMAINED BELOW THE NORMAL RANGE. RECENT RAINS BROUGHT AT LEAST TEMPORARY RELIEF TO THE TAMPA AREA OF SOUTHERN FLORIDA WHERE WATER DEMANDS HAD BEEN EXCEEDING LOCAL SUPPLIES. FLOODING OCCURRED IN WESTERN NORTH CAROLINA.

In west-central Florida, monthly mean flow of Peace River at Arcadia (drainage area, 1,367 square miles)



Monthly mean discharge of Pascagoula River at Merrill, Miss. (Drainage area, 6,600 sq mi; 17,100 sq km)

increased contraseasonally to 94 cfs, only 42 percent of median and below the normal range for the 9th consecutive month, but one and one-half times the minimum monthly mean discharge of record for May, which occurred in 1945. The daily mean flow of 180 cfs on May 31 was about 5 times the minimum daily mean flow of record for May, and indicated an upward trend in flow at monthend. Also in west-central Florida, monthly mean discharge of Hillsborough River near Zephyrhills (drainage area, 220 square miles) was about 53 cfs. Flow at that gaging station declined to 46 cfs (lowest flow observed since records began in 1939) three times during the month (between periods of runoff from several rains) and was 59 cfs on May 30. Downstream at the Fowler Avenue gaging station (index of inflow to water-supply reservoir for city of Tampa) the daily mean discharge May 30 was 53 cfs. In southeastern Florida, flow of Miami Canal at Miami (which was 0 cfs during April) increased to 11 cfs; 22 percent of normal. In southwestern Florida, flow southward through the Tamiami Canal outlets, 40-mile bend to Monroe (which also was 0 cfs during April) increased to 15 cfs; 62 percent of normal. In the northern part of the State, the discharge of Silver Springs decreased 25 cfs, to 660 cfs; 85 percent of normal. Also in northern Florida, monthly mean discharge of Suwannee River at Branford decreased seasonally but was augmented by high carryover flow from April and remained in the above-normal range. In the northwestern part of the State, high carryover flow from April also contributed to above-normal monthly mean flow on Shoal River near Crestview during May.

In southern Georgia, monthly mean flow of Alapaha River near Statenville (tributary to Suwannee River) also remained in the above-normal range and was almost 3 times the median flow for May, as a result of high carryover flow from April, augmented by runoff from several rains. In the northern part of the State, runoff from frequent rains retarded the normal seasonal decrease in streamflow and monthly mean discharges at the index stations, Oconee River near Greensboro, and Etowah River at Canton, were about one and one-half times median for May, and in the above-normal range for the 3d time in the past 4 months. Cumulative runoff at Greensboro during those 4 months was nearly twice the median cumulative runoff for the period.

In southeastern Mississippi, monthly mean discharge of Pascagoula River at Merrill increased contraseasonally, was more than 3 times median, and was above the normal range for the 5th time in the past 6 months (see graph). In the west-central part of the State, flow of Big Black River also increased contraseasonally, as a result of frequent rains, and the monthly mean discharge at Bovina was more than 4 times median, and also was in the above-normal range for the 5th time in 6 months. In northern Mississippi, monthly mean flow of Tombigbee River at Columbus decreased seasonally but was above the normal range and almost twice the median flow for May.

In Tennessee, as in the adjacent area of northern Georgia, runoff from above-normal rainfall retarded the normal seasonal declines in streamflow and monthly mean discharges were near or in the above-normal range at all index stations. Mean flows during May of Duck River above Hurricane Mills and Harpeth River near Kingston Springs, in central Tennessee, were above the normal range and about twice the May median flow. In the eastern part of the State, mean flow of Emory River at Oakdale was only 5 percent less than mean flow during April, compared to the normal decrease of 53 percent from April to May, and was near the above-normal range.

In the western Piedmont and Tennessee River basin areas of western North Carolina, representative monthly mean flows of South Yadkin River near Mocksville and French Broad River at Asheville increased contraseasonally as a result of runoff from several rains, and were above the normal range. Some lowland flooding occurred in the southern and western mountain sections of the western Piedmont area May 15–18. In the eastern Piedmont and Coastal Plain areas of the State, monthly mean discharge of Neuse River near Clayton decreased seasonally and was less than median for the 2d consecutive month.

In the northern part of the region, flows were in the normal range in Kentucky and Virginia, decreasing seasonally at some index stations and increasing contraseasonally at others. In West Virginia, monthly mean flows increased contraseasonally into the above-normal range and were about twice the median flows for May on Kanawha River at Kanawha Falls, Greenbrier River at Alderson, and Potomac River at Paw Paw.

Ground-water levels rose slightly in the mountain and Piedmont areas of North Carolina and rose also in most of West Virginia and in the bedrock aquifers of eastern and western Kentucky. Levels generally declined in the Coastal Plain part of North Carolina and in much of Mississippi, Alabama, the Piedmont of Georgia, and in the shallow limestone and sandstone aquifers of central Kentucky. In southwestern Mississippi, levels rose slightly in some wells in aquifers of Miocene age. In Georgia in outlying parts of the heavily pumped Brunswick and Savannah areas, levels remained about the same, with slight declines predominating for the Brunswick outlying area and slight rises for the Savannah area. Monthend levels were above average in Kentucky, most of West Virginia, and in the mountain and Piedmont areas of North Carolina; whereas levels remained below average in North Carolina's Coastal Plain. In Florida, levels declined in the north and rose in some central-peninsular parts of the State. In west-central Florida, levels in the Floridan aquifer recovered as much as 10 feet from the record low levels that occurred early in the month; the rising levels followed recharge from scattered showers over the inland part of the west coast. Major rises also occurred in Hardee and DeSoto Counties and in southern Polk County as well as in southeastern Florida (heavy rains caused this reversed trend in that area).

WESTERN GREAT LAKES REGION

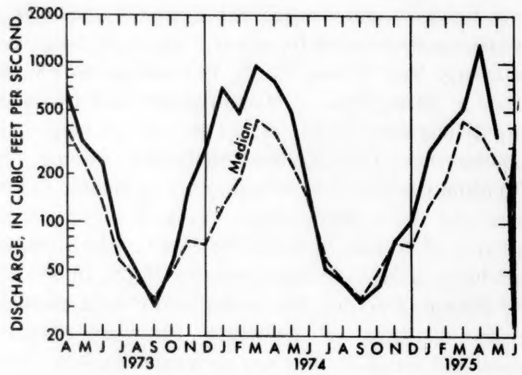
[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

STREAMFLOW INCREASED IN PARTS OF ONTARIO, MICHIGAN, AND MINNESOTA, AND DECREASED SEASONALLY ELSEWHERE IN THE REGION. FLOWS REMAINED ABOVE THE NORMAL RANGE IN PARTS OF ILLINOIS, WISCONSIN, AND MINNESOTA, AND BELOW THAT RANGE IN PARTS OF ONTARIO. FLOODING OCCURRED IN ILLINOIS NEAR MONTHEND.

In parts of Ontario, Michigan, and Minnesota, where snowmelt runoff was retarded during April and flows were below the normal range, monthly mean discharges increased sharply in May, were above the normal range, and were as much as 8 times the median flows for the month. In west-central Minnesota, northeastern and southern parts of Wisconsin, and in northern Illinois, monthly mean discharges at index stations decreased seasonally, but partly as a result of high carryover flows from April were above the normal range for May. Minor flooding occurred in many parts of Illinois near monthend as a result of runoff from local thunderstorms.

In the southern part of the region, monthly mean discharges generally were less than median except in south-central Indiana, where flow of East Fork White River at Shoals remained well above median for the month. Monthly mean discharges were above the normal range in 6 of the past 9 months at that index station. In central Ohio, where monthly mean discharges of Scioto River at Higby were in the above-normal range in 7 of the past 9 months, mean flow decreased sharply in May and was only 62 percent of median for the month.

In Michigan's Lower Peninsula, monthly mean flow of Red Cedar River at East Lansing decreased sharply but remained above median for the 7th consecutive month (see graph).



Monthly mean discharge of Red Cedar River at East Lansing,Mich. (Drainage area, 355 sq mi; 919 sq km)

In the northern part of the region, where mean flow of Missinaibi River at Mattice, in east-central Ontario, was only 23 percent of median and below the normal range in April, flow increased seasonally in May but the monthly mean discharge remained below the normal range.

Ground-water levels continued to rise in shallow wells in Minnesota and rose also in most of Michigan. Levels generally declined in Indiana and Ohio. Monthend levels were below average in Ohio; near average in Indiana; and above average in most of Michigan and Minnesota. In eastern Minnesota, in the heavily pumped Minneapolis-St. Paul area, artesian levels started to decline in the Prairie du Chien-Jordan aquifer and continued to rise in the deeper Mt. Simon-Hinckley aquifer.

MIDCONTINENT

[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

STREAMFLOW INCREASED AND WAS ABOVE THE NORMAL RANGE IN MANITOBA AND PARTS OF NORTH DAKOTA, IOWA, LOUISIANA, AND

TEXAS. FLOWS GENERALLY DECREASED AND WERE LESS THAN MEDIAN IN PARTS OF NEBRASKA, KANSAS, MISSOURI, AND LOUISIANA. FLOODING OCCURRED IN LOUISIANA, OKLAHOMA, AND TEXAS.

In central Texas, rapid runoff from intense thunderstorms resulted in flooding in several urban areas, including Austin, Bryan, Luling, San Antonio, and San Marcos. Similar flooding occurred also at Wichita Falls, in north-central Texas, and at Waurika, in the adjacent area of south-central Oklahoma. A peak discharge of 12,000 cfs (gage height, 25.8 feet) occurred May 24 on Beaver Creek near Waurika, upstream from its confluence with Cow Creek at Waurika. Also in central Texas, near San Antonio, the monthly mean discharge of 1,858 cfs on Guadalupe River near Spring Branch (drainage area 1,315 square miles) was the highest for May since records began in July 1922. Mean flow at this index station has been in the above-normal range each month since August 1974 and the cumulative runoff during the first 8 months of the 1975 water year was almost 4 times median runoff for that period.

In central Louisiana, flooding occurred in and near Alexandria as a result of runoff from intense rains May 3 and 6 to 8. East of Alexandria, flooding continued along the lower reaches of Red and Black Rivers. At Baton Rouge, in the southeastern part of the State, the second major rise of the 1975 flood season on the Mississippi River began in early May and crested at a stage of 36.9 feet on May 20, 4.7 feet lower than the first crest, which occurred April 15, and 1.9 feet above National Weather Service flood stage. Monthly mean discharges increased sharply at all index stations in Louisiana and were 4 to 6 times respective medians for May.

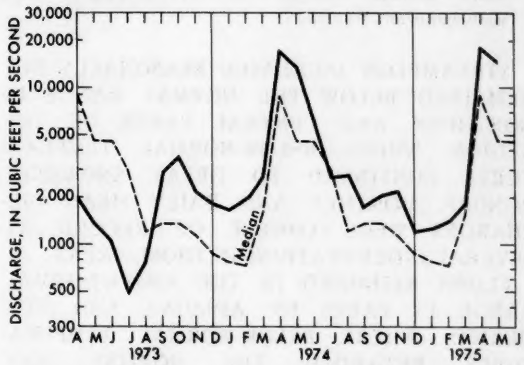
In southern Arkansas, flow at the index station, Saline River near Rye, increased contraseasonally and the monthly mean discharge was 3 times median for the month, but in the northern part of the State, flow of Buffalo River near St. Joe decreased to 43 percent of the May median flow and was below the normal range.

In Missouri, Kansas, and Nebraska, monthy mean flows generally decreased and were less than median. In eastern Kansas, runoff from intense thunderstorms near monthend increased flows moderately on many streams.

In eastern and north-central parts of Iowa, monthly mean flows at index stations were above the normal range, but flows elsewhere in the State generally were in the normal range. Bankfull stages occurred on some small streams as a result of runoff from local thunderstorms.

In central South Dakota, where monthly mean flow of Bad River near Fort Pierre was almost 9 times median in April, monthly mean discharge remained in the above-normal range and was 4 times the median flow for May.

In south-central North Dakota, flow increased contraseasonally on Cannonball River at Breien (drainage area, 4,100 square miles) and the monthly mean discharge of 2,406 cfs was the highest for May since records began in August 1934 and about 26 times the median flow for the month. In the eastern part of the State, flow of Red River of the North at Grand Forks decreased seasonally but was more than 3 times median and in the above-normal range (see graph).



Monthly mean discharge of Red River of the North at Grand Forks, N. Dak. (Drainage area, 30,100 sq mi; 78,000 sq km)

In south-central Manitoba, monthly mean flow of Waterhen River below Waterhen Lake increased seasonally and was in the above-normal range for the 12th time in the past 13 months. The level of Lake Winnipeg at Gimli averaged 716.56 feet above mean sea level, 3.01 feet higher than the May long-term mean, and 0.25 foot higher than last month.

Ground-water levels generally declined in Nebraska (except in the northwest), Iowa, and Kansas. Monthend levels were near or above average in Iowa and in key observation wells in eastern Kansas; and continued above average in North Dakota. In the Grand Prairie rice-growing area of east-central Arkansas, the level in the shallow aquifer was unchanged and was in the same range of May values that has prevailed since 1964. In the industrial aquifer of central and southern Arkansas (Sparta Sand), levels declined at Pine Bluff (lowest of record for May) and El Dorado (above average). In north-central Louisiana, levels have recovered more than 30 feet in the Sparta Sand at Hodge (70 miles east of Shreveport) in the past three months, reflecting a decrease in industrial pumpage. In southwestern Louisiana, levels in the Chicot aquifer declined sharply as a result of heavy pumping for irrigation, delayed in starting because of a wet cool spring. Levels in most of

the Baton Rouge aquifers were near seasonal highs. In Texas, levels rose in the Edwards Limestone at San Antonio; continued to rise in the Edwards Limestone at Austin; and declined at Houston (Evangeline aquifer) and El Paso (bolson deposits). Monthend levels were above average at Austin and San Antonio, and below average at Houston (lowest of record for May) and El Paso (alltime low).

WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

STREAMFLOW INCREASED SEASONALLY BUT REMAINED BELOW THE NORMAL RANGE IN NORTHERN AND CENTRAL PARTS OF THE REGION WHERE BELOW-NORMAL TEMPERATURES CONTINUED TO DELAY SNOWMELT RUNOFF. MONTHLY AND DAILY MEAN DISCHARGES WERE LOWEST OF RECORD AT SEVERAL INDEX STATIONS IN THOSE AREAS.

FLOWS REMAINED IN THE ABOVE-NORMAL RANGE IN PARTS OF ARIZONA AND NEW MEXICO, WHERE BELOW-NORMAL TEMPERATURES RETARDED THE NORMAL MAY RECESSIONS.

Monthly mean flow of Fraser River at Hope, in British Columbia, and Bow River at Banff, in Alberta, continued to increase seasonally but remained in the below-normal range for the 2d and 3d consecutive months, respectively, as a result of below-normal temperatures and delayed snowmelt. Similarly, flow of Middle Fork Flathead River near West Glacier, in northwestern Montana, west of the Continental Divide, increased seasonally but remained in the below-normal range. In south-central Montana, the normal seasonal increase in flow on Yellowstone River at Corwin Springs (drainage area, 2,623 square miles) also was delayed by below-normal temperatures and the monthly mean discharge of 2,524 cfs was lowest for the month in 69 years of record.

In nearby areas of Wyoming, flows of Tongue River near Dayton, and Snake River, as measured near Heise, Idaho, near the Wyoming-Idaho boundary, increased seasonally but because of low carryover flows from April and below-normal snowmelt runoff in May, monthly mean discharges remained below the normal range.

In Utah, flows increased but were below the normal range except in the extreme southern part of the State, where flows of Virgin and San Juan Rivers remained in the normal range. In southwestern Utah, where the monthly mean discharge of Beaver River near Beaver (drainage area, 82 square miles) during April was the lowest of record for the month, the daily mean discharge of 21 cfs on May 7 was the lowest for May since records began in April 1914. In the northern part of the State, the daily mean of 74 cfs, May 1, on Weber River near Oakley (drainage area, 163 square miles) was the lowest for May in 70 years of record, and the daily mean of 21 cfs, May 2, on Whiterocks River near Whiterocks (drainage area, 113 square miles) was lowest for May in 68 years of record. Monthly mean discharges at the index station near Whiterocks have been in the below-normal range in 11 of the past 12 months. Also in northern Utah, the level of Great Salt Lake rose 0.45 foot during the month (to 4,201.35 feet above mean sea level), the highest level reached in 46 years, 0.05 foot higher than the peak of a year ago, 2.35 feet higher than the average level for May, and 10.00 feet higher than the alltime low of October 1963.

In Idaho, temperatures were below normal during most of the month but snowmelt runoff at low and intermediate elevations resulted in monthly mean flows in the above-normal range in the Coeur d'Alene, Weiser, Clearwater, and Snake River (at Weiser) basins. Monthly mean flows of Salmon River at Whitebird and Snake River near Heise, in central and southeastern Idaho, and in the Kootenai River basin in the northern part of the State, were below the normal range. Only small amounts of snowmelt runoff occurred at the higher elevations.

In Washington and northern Oregon, where flows were below the normal range in April, monthly mean discharges in May generally were above median or in the above-normal range. At index stations in California, where April flows generally were less than median, flows increased, except in the north-coastal part, and were greater than median flows for May.

In northern Nevada, flow of Humboldt River at Palisade increased sharply, was about 3 times the median flow for May, and in the above-normal range for the 3d time in the past 4 months.

In the southern part of the region, flows increased seasonally and were greater than median in northern New Mexico, but in the southwestern part of that State, monthly mean flow of Gila River near Gila decreased seasonally and remained above the normal range for the 4th consecutive month (see graph on page 8). In the adjacent area of Arizona, flow of Gila River at head of Safford Valley, near Solomon, also decreased seasonally and remained in the above-normal range for the 3d consecutive month. At the index stations, Salt River near Roosevelt and San Pedro River at Charleston, also in southern Arizona, seasonal decreases in flow were retarded, as a result of below-normal temperatures, and monthly mean discharges during May were above the normal range.

(Continued on page 8.)

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF MAY 1975

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Apr. 1975	End of May 1975	End of May 1974	Average for end of May	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	63	72	78	78	223,400 (a)
QUEBEC					
Gouin (P)	53	68	87	59	6,954,000 ac-ft
Allard (P)	49	83	97	87	280,600 ac-ft
MAINE					
Seven reservoir systems (MP)	47	90	96	89	178,489 mcf
NEW HAMPSHIRE					
Lake Winnipesaukee (PR)	93	93	103	101	7,200 mcf
Lake Francis (FPR)	31	66	96	81	4,326 mcf
First Connecticut Lake (P)	17	76	94	86	3,330 mcf
VERMONT					
Somerset (P)	68	89	98	86	2,500 mcf
Harriman (P)	62	88	90	87	5,060 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	89	91	89	90	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	90	97	100	98	34,270 mcf
Indian Lake (FMP)	62	106	104	104	4,500 mcf
New York City reservoir system (MW)	99	100	100	.....	547,500 mg
NEW JERSEY					
Wanaque (M)	99	100	99	94	27,730 mg
PENNSYLVANIA					
Wallenpaupack (P)	74	87	86	85	6,875 mcf
Pymatuning (FMR)	96	96	100	99	8,191 mcf
MARYLAND					
Baltimore municipal system (M)	100	100	100	94	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	95	99	95	91	12,580 mcf
High Rock Lake (P)	81	96	93	81	10,230 mcf
Narrows (Badin Lake) (P)	99	97	98	100	5,616 mcf
SOUTH CAROLINA					
Lake Murray (P)	91	92	94	81	70,300 mcf
Lakes Marion and Moultrie (P)	85	96	87	77	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	77	78	77	75	75,360 mcf
GEORGIA					
Burton (PR)	96	95	100	93	104,000 ac-ft
Lake Sidney Lanier (FMPR)	65	65	68	67	1,686,000 ac-ft
Sinclair (MPR)	92	97	91	93	214,000 ac-ft
ALABAMA					
Lake Martin (P)	99	100	98	94	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	73	76	68	65	1,156,000 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	83	84	85	70	1,452,000 cfsd
Douglas Lake (FPR)	66	79	82	70	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	86	86	87	82	512,200 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	86	84	93	84	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	65	96	94	86	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	60	85	80	82	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	40	47	42	37	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	88	94	85	.....	22,640,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	84	86	83	79	1,948,000 ac-ft
OKLAHOMA					
Keystone (FPR)	99	154	133	102	661,000 ac-ft
Lake O' The Cherokees (FPR)	94	96	97	92	1,492,000 ac-ft
Tenkiller Ferry (FPR)	103	106	101	102	628,200 ac-ft
Lake Altus (FIMR)	67	72	62	64	134,500 ac-ft
Eufaula (FPR)	102	108	103	90	2,378,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	99	112	101	103	2,722,000 ac-ft
TEXAS					
Possum Kingdom (IMPRW)	90	96	83	106	569,400 ac-ft
Buchanan (IMPW)	96	98	86	84	955,200 ac-ft
Bridgeport (IMW)	71	79	54	49	386,400 ac-ft
Eagle Mountain (IMW)	100	99	91	91	190,300 ac-ft
Medina Lake (I)	100	100	100	51	254,000 ac-ft
Lake Travis (FIMPRW)	100	100	98	81	1,144,000 ac-ft
Lake Kemp (IMW)	50	57	52	94	268,000 ac-ft
THE WEST					
ALBERTA					
Spray (P)	...	...	...	22	210,000 ac-ft
Lake Minnewanka (P)	...	...	...	33	199,700 ac-ft
St. Mary (I)	...	...	...	79	320,800 ac-ft
WASHINGTON					
Franklin D. Roosevelt Lake (IP)	8	12	17	73	5,232,000 ac-ft
Lake Chelan (PR)	12	48	55	75	676,100 ac-ft
IDAHO--WYOMING					
Upper Snake River (7 reservoirs) (IMP)	61	60	63	82	4,282,000 ac-ft
WYOMING					
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	69	73	78	54	3,056,200 ac-ft
Buffalo Bill (IP)	56	48	49	75	421,300 ac-ft
Boysen (FIP)	64	65	67	64	802,000 ac-ft
Keyhole (F)	74	78	83	42	199,900 ac-ft
COLORADO					
John Martin (FIR)	0	0	0	16	364,400 ac-ft
Colorado–Big Thompson project (I)	69	73	91	64	722,600 ac-ft
Taylor Park (IR)	47	58	81	74	106,200 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell, Flaming Gorge, Navajo, and Blue Mesa Reservoirs (IFPR)	70	74	78	.....	31,276,500 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	80	84	89	67	1,421,000 ac-ft
CALIFORNIA					
Hetch Hetchy (MP)	12	49	79	70	360,400 ac-ft
Lake Almanor (P)	85	94	107	62	1,036,000 ac-ft
Shasta Lake (FIPR)	101	104	104	93	4,377,000 ac-ft
Millerton Lake (FI)	75	60	88	82	503,200 ac-ft
Pine Flat (FI)	57	72	92	72	1,014,000 ac-ft
Isabella (FIR)	39	50	71	41	551,800 ac-ft
Folsom (FIP)	67	84	90	92	1,000,000 ac-ft
Lake Berryessa (FIMW)	101	99	99	88	1,600,000 ac-ft
Clair Engle Lake (Lewiston) (P)	88	96	99	96	2,438,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	75	78	90	69	744,600 ac-ft
NEVADA					
Rye Patch (I)	83	83	93	.....	157,200 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	75	75	73	67	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	23	19	42	17	1,093,000 ac-ft
Salt and Verde River system (IMPR)	70	70	67	47	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	38	31	57	77	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	17	21	28	29	2,539,000 ac-ft

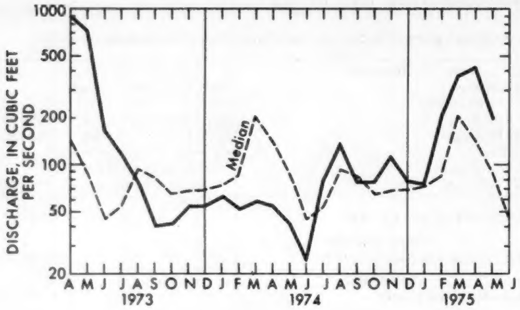
[a]Thousands of kilowatt-hours

METRIC EQUIVALENTS OF UNITS USED IN THE WATER RESOURCES REVIEW

(Round-number conversions, to nearest four significant figures)

1 foot = 0.3048 metre 1 mile = 1.609 kilometres
1 acre = 0.4047 hectare = 4,047 square metres
1 square mile (sq mi) = 259 hectares = 2.59 square kilometres (sq km)
1 acre-foot (ac-ft) = 1,233 cubic metres
1 million cubic feet (mcf) = 28,320 cubic metres
1 cubic foot per second (cfs) = 0.02832 cubic metres per second = 1.699 cubic metres per minute
1 second-foot-day (cfsd) = 2,447 cubic metres per day
1 million gallons (mg) = 3,785 cubic metres = 3.785 million litres
1 million gallons per day (mgd) = 694.4 gallons per minute (gpm) = 2.629 cubic metres per minute = 3,785 cubic metres per day

(Continued from page 6.)



Monthly mean discharge of Gila River near Gila, N.Mex. (Drainage area, 1,864 sq mi; 4,828 sq km)

Storage increased in some major reservoirs and decreased in others, and generally was above average in Colorado and California and below average in Washington and southern Idaho. Net increase in storage in the Colorado River Storage Project was 1,272,200 acre-feet during the month.

Ground-water levels generally declined in northwestern Washington (at Sumas, Whatcom County), in Utah (except near Logan and Blanding), and in southern parts of California, Arizona, and New Mexico. Levels rose in eastern and central Washington (Spokane and Cashmere), in Montana, and at Logan and Blanding in northern and southeastern Utah. In Idaho, levels in most wells rose or changed only slightly. Monthend levels were above average at Cashmere in central Washington, in the Snake River Group aquifer of southern Idaho, in most of Nevada (except Las Vegas and Truckee Meadows), and at Logan and Blanding in Utah; were near average in Montana (except for above-average levels in two key wells in the western intermountain valleys); and were below average in most of Utah, at Sumas and Spokane in Washington, and in southern New Mexico. In southern Arizona, monthend levels were lowest of record for May in the Elfrida and Tucson No. 2 key wells, and at an alltime low in the Avra Valley well.

ALASKA

Streamflow increased seasonally and was in the normal range at all index stations in the State except in Little Susitna River basin, in south-central Alaska, where cool, cloudy weather delayed melting of the above-normal snowpack and monthly mean discharge at the station near Palmer was below the normal range. In the south-coastal area, flow of Kenai River at Cooper Landing increased sharply as a result of increased snowmelt runoff during the last half of the month and the monthly mean discharge was well above median. In the interior, record-high temperatures––79° and 80°F

(Continued on page 11.)

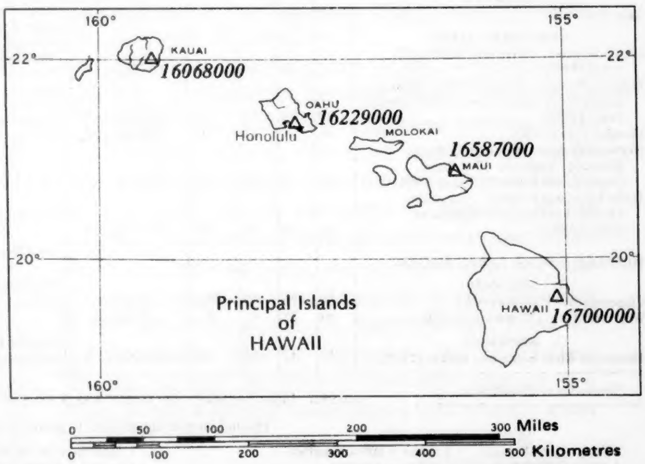
INDEX STATIONS AND SELECTED LARGE-RIVER STREAM-GAGING STATIONS IN ALASKA AND HAWAII

Streamflow conditions as described each month in the Water Resources Review, including the front-page map, are based primarily on data from "index" and selected large-river stations––stream-measurement sites with long periods of record and typical of surface-water conditions in a particular Province, State, or region. Flows at index stations represent relatively natural conditions; that is, generally free of man-made controls or effects such as upstream dams and diversions. Flows at large-river stations may be affected markedly by upstream reservoir controls (storage or releases) and/or upstream diversions such as for irrigation. Stations selected for the "large-river" category have either large drainage areas or large flows, usually both.

In Alaska, there are four index stations and one large-river station. In Hawaii, there are four index stations.

Seasonally highest flows in Alaska occur during the late spring, summer, or autumn and are the result of melting of snow and glaciers, rainstorms, or a combination of these factors. Seasonally low flows occur in late winter or spring during freezeup or in midsummer during dry years on some streams. In Hawaii, high flows are usually associated with the winter rainy season and low flows with the prevailing warm, dry summer conditions; major storms occur most frequently between October and March.

Locations of, and mean and extreme flows of record at each of the nine stations in Alaska and Hawaii are shown in the accompanying maps and table.

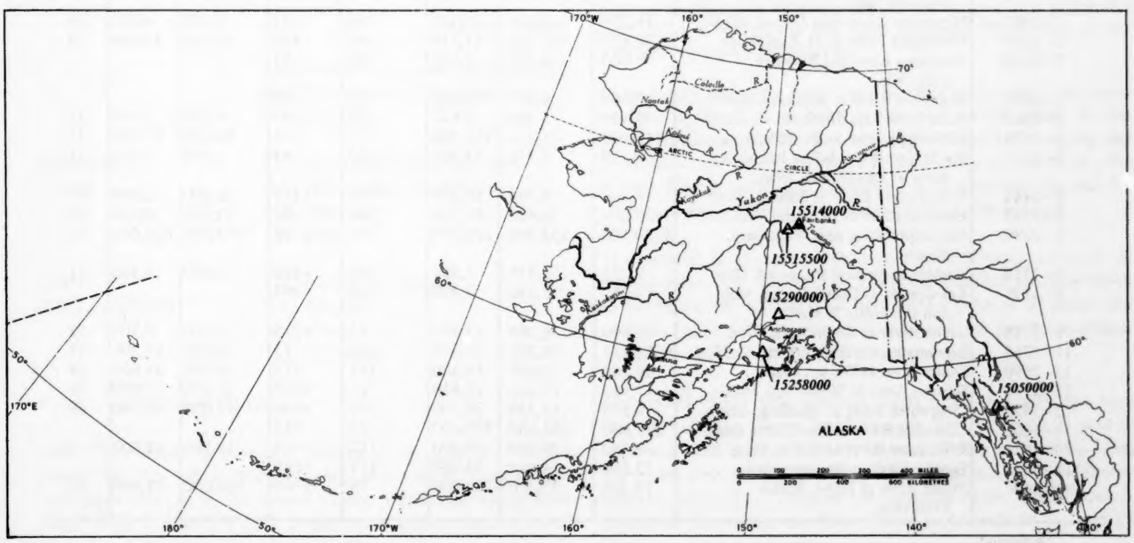


Location of selected stream-gaging stations in Hawaii described in table on page 9.

Index and large-river stream-gaging stations, Alaska and Hawaii; used in preparation of the Water Resources Review

Name of index (In) and large-river (LR) gaging station (listed by States, and then alphabetically by rivers)	Station number	Drainage area, in sq mi (sq km)	Stream discharge				
			Period of record through 1972				1941–70
			Period, in years (total years of record)	Maximum, in cfs; date	Minimum, in cfs; date	Mean, in cfs (m^3/s)	Median, in cfs (m^3/s)
ALASKA							
Chena River at Fairbanks. (In) . . .	15514000	1,980 (5,130)	1948– (24)	74,400 Aug. 15, 1967	(a)	1,515 (43)	[b]1,346 (38)
Gold Creek at Juneau. (In)	15050000	9.76 (25.28)	1916–20, 1946–48, 1949– (29)	2,650 Aug. 12, 1961	[c]0	107 (3.0)	[d]107 (3.0)
Kenai River at Cooper Landing. (In)	15258000	634 (1,642)	1947– (25)	21,500 Sept. 1, 1967	[e]0	[f]2,712 (77)	[g]2,629 (74)
Little Susitna River near Palmer. (In)	15290000	61.9 (160.3)	1948– (24)	7,840 Aug. 10, 1971	(a)	204 (5.8)	[h]201 (5.7)
Tanana River at Nenana. (LR) . . .	15515500	25,600 (66,300)	1962– (10)	186,000 Aug. 18, 1967	(a)	24,350 (690)	[i]24,070 (682)
HAWAII							
East Branch of North Fork Wailua River near Lihue, Kauai. (In)	16068000	6.27 (16.24)	1912– (57)	18,400 Nov. 12, 1955	6.8 July 3, 13, 1926	48.7 (1.4)	46.8 (1.3)
Honopou Stream near Huelo, Maui. (In)	16587000	.64 (1.66)	1910– (61)	5,710 Nov. 18, 1930	[j].02	4.77 (.1)	4.29 (.1)
Kalihi Stream near Honolulu, Oahu. (In)	16229000	2.61 (6.76)	1913– (58)	[k]12,400 Nov. 18, 1930	.09 Oct. 22, 1933, July 29, 1966	6.96 (.2)	6.18 (.2)
Waiakea Stream near Mountain View, Hawaii. (In)	16700000	17.4 (45.1)	1930– (42)	565 Mar. 14, 1942 Aug. 26, 1970	[l]0	11.9 (.3)	11.7 (.3)

Note: Multiply cfs by 0.02832 to convert to m^3/s (cubic metres per second).
[a]Not determined.
[b]1949–70; 1949–72, 1,412 cfs.
[c]No flow at times during winters of 1951 and 1956.
[d]1950–70; 1950–72, 107 cfs.
[e]No flow Mar. 27, 28, 1964 (caused by earthquake).
[f]Adjusted to exclude diversion from Cooper Lake.
[g]1948–70; 1949–72, 2,629 cfs.
[h]1949–70; 1949–72, 207 cfs.
[i]1963–70; 1963–72, 24,600 cfs.
[j]Several days in 1933, 1934.
[k]About.
[l]No flow at times.



Location of selected stream-gaging stations in Alaska described in above table.

CORRECTION: In last month's issue of the Review, the station-location map on page 12 showed an incorrect location for stream-gaging station 11532500, Smith River near Crescent City, Calif. The correct location is still farther northwest in the extreme northwestern part of the State. (The plotted location shown is that of Salmon River at Somes Bar, Calif., previously used as an index station.)

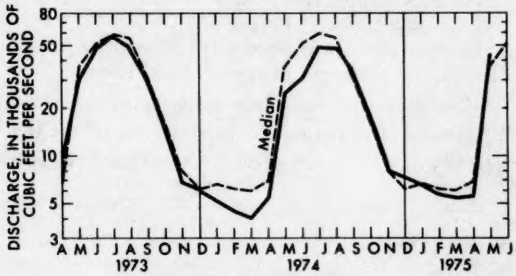
FLOW OF LARGE RIVERS DURING MAY 1975

Station number*	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	May 1975					
				Monthly discharge (cfs)	Percent of median monthly discharge, 1941–70	Change in discharge from previous month (percent)	Discharge near end of month (cfs)	Discharge near end of month (mgd)	Date
1–0140	St. John River below Fish River at Fort Kent, Maine.	5,690	9,397	48,270	154	+248	19,000	12,300	31
1–3185	Hudson River at Hadley, N.Y	1,664	2,791	6,100	137	-9	2,400	1,600	31
1–3575	Mohawk River at Cohoes, N.Y	3,456	5,450	8,030	132	-30	....	......	.....
1–4635	Delaware River at Trenton, N.J	6,780	11,360	16,880	118	-4	11,900	7,700	27
1–5705	Susquehanna River at Harrisburg, Pa.	24,100	33,670	50,810	101	+18	26,000	16,800	31
1–6465	Potomac River near Washington, D.C.	11,560	[1]10,640	20,630	155	+36	12,470	8,100	31
2–1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	4,847	4,436	141	-36	2,740	1,800	31
2–1310	Pee Dee River at Peedee, S.C	8,830	9,098	14,600	206	-34	13,800	8,900	28
2–2260	Altamaha River at Doctortown, Ga.	13,600	13,380	26,570	220	-52	25,900	16,700	29
2–3205	Suwannee River at Branford, Fla	7,740	6,775	15,150	227	-14	11,200	7,200	30
2–3580	Apalachicola River at Chattahoochee, Fla.	17,200	21,690	26,600	132	-62	21,700	14,000	29
2–4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala.	15,400	21,700	23,460	149	-56	9,700	6,300	29
2–4895	Pearl River near Bogalusa, La	6,630	8,533	29,240	295	+51	4,860	3,100	31
3–0495	Allegheny River at Natrona, Pa	11,410	[1]18,700	20,050	83	-14	16,000	10,300	28
3–0850	Monongahela River at Braddock, Pa.	7,337	[1]11,950	22,220	161	+5	15,600	10,000	28
3–1930	Kanawha River at Kanawha Falls, W.Va.	8,367	12,370	23,170	183	+49	23,700	15,300	26
3–2345	Scioto River at Higby, Ohio	5,131	4,337	3,483	62	-47	1,900	1,200	29
3–2945	Ohio River at Louisville, Ky[2]	91,170	110,600	174,000	129	-24	130,900	84,600	27
3–3775	Wabash River at Mount Carmel, Ill.	28,600	26,310	42,280	122	-20	36,000	23,300	31
3–4690	French Broad River below Douglas Dam, Tenn.	4,543	[1]6,528	8,689	137	-20	....	......	.....
4–0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis.[2]	6,150	4,142	9,400	199	+62	....	......	.....
02MC002 (4–2643.31)	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y.[3]	299,000	239,100	306,000	119	+2	309,000	200,000	31
050115	St. Maurice River at Grand Mere, Quebec.	16,300	24,900	90,500	154	+337	29,840	19,300	27
5–0825	Red River of the North at Grand Forks N. Dak.	30,100	2,439	14,380	316	-18	5,200	3,400	31
5–3300	Minnesota River near Jordan, Minn ..	16,200	3,306	13,230	260	+42	6,190	4,000	29
5–3310	Mississippi River at St. Paul, Minn ...	36,800	[1]10,230	51,310	240	+69	28,600	18,500	28
5–3655	Chippewa River at Chippewa Falls, Wis.	5,600	5,062	7,128	104	-51	....	......	.....
5–4070	Wisconsin River at Muscoda, Wis	10,300	8,457	15,800	149	+6	....	......	.....
5–4465	Rock River near Joslin, Ill	9,520	5,288	12,620	202	-27	8,120	5,200	31
5–4745	Mississippi River at Keokuk, Iowa ...	119,000	61,210	191,500	219	+52	96,000	62,000	31
5–4855	Des Moines River below Raccoon River at Des Moines, Iowa.	9,879	3,796	13,240	230	+4	5,890	3,800	31
6–2145	Yellowstone River at Billings, Mont.	11,795	6,754	15,100	116	+179	20,000	12,900	31
6–9345	Missouri River at Hermann, Mo	528,200	78,480	87,100	96	-29	59,900	38,800	26
7–2890	Mississippi River near Vicksburg, Miss.[4]	1,144,500	552,700	1,162,000	136	-25	974,000	630,000	31
7–3310	Washita River near Durwood, Okla ..	7,202	1,379	5,993	289	+168	7,000	4,500	31
8–3130	Rio Grande at Otowi Bridge, near San Ildefonso, N.Mex.	14,300	1,530	4,209	163	+104	....	......	.....
9–3150	Green River at Green River, Utah ...	40,600	6,369	12,897	91	+219	15,000	9,700	31
11–4255	Sacramento River at Verona, Calif ...	21,257	18,370	27,300	141	+2	26,800	17,300	23
13–2690	Snake River at Weiser, Idaho	69,200	17,670	45,500	181	+12	36,400	23,600	28
13–3170	Salmon River at White Bird, Idaho ..	13,550	11,060	20,610	65	+249	24,100	15,600	25
13–3425	Clearwater River at Spalding, Idaho ..	9,570	15,320	35,700	70	+130	29,000	18,700	28
14–1057	Columbia River at The Dalles, Oreg.[5]	237,000	194,000	307,000	92	+48	....	......	.....
14–1910	Willamette River at Salem, Oreg	7,280	23,370	23,600	112	+19	19,800	12,800	27–31
15–5155	Tanana River at Nenana, Alaska	25,600	24,040	43,240	119	+686	....	......	.....
8MF005	Fraser River at Hope, British Columbia.	78,300	95,300	140,000	78	+268	150,000	97,000	29

[1]Adjusted.
[2]Records furnished by Corps of Engineers.
[3]Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4]Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5]Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.
*The U.S. station numbers as listed in this table are in a shortened form previously in use, and used here for simplicity of tabular and map presentation. The full, correct number contains 8 digits and no punctuation marks. For example, the correct form for station number 1–3185 is 01318500.

(Continued from page 8.)

(26° and 27°C) at Fairbanks on May 10 and 11, compared to previous highs of 69° and 72°F (21° and 22°C)—resulted in rapid snowmelt runoff and minor flooding along the Chatanika, Chena, and Salcha Rivers in the Tanana River basin. Road systems and homes on the flood plains were damaged, and significant damage also occurred in the Chena River Flood Control Project (under construction), including silt contamination of mineral soils that were stripped of organic cover, and washouts of bridges and roadway along the access road. Monthly mean discharge of Tanana River at Nenana increased sharply and was greater than median (see graph).

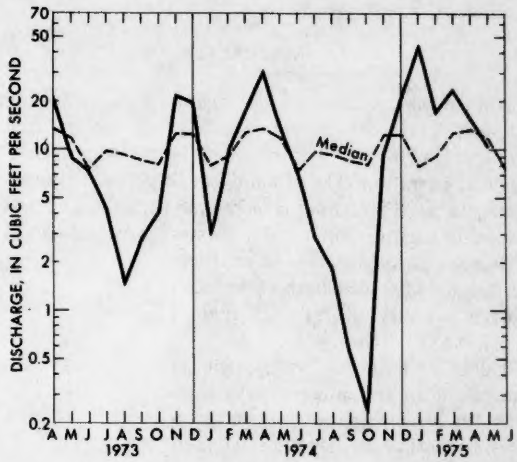


Monthly mean discharge of Tanana River at Nenana, Alaska (Drainage area, 25,600 sq mi; 66,300 sq km)

Ground-water levels in the Anchorage area continued to rise slightly in the water-table aquifer; and rose an average of 3 feet in the confined aquifers, except for little or no change near centers of major pumping.

HAWAII

Streamflow decreased seasonally at all index stations in the State and was in the normal range except on the island of Maui where monthly mean flow of Honopou Stream near Huelo was only 40 percent of median and in the below-normal range. Rainfall during the month was reported to be below normal on Maui. On the island of Hawaii, monthly mean discharge of Waiakea Stream near Mountain View decreased sharply and was less than median for the first month since December 1974 (see graph).



Monthly mean discharge of Waiakea Stream near Mountain View, Hawaii (Drainage area, 17.4 sq mi; 45.1 sq km)

WATER RESOURCES REVIEW

MAY 1975

Based on reports from the Canadian and U.S. field offices; completed June 5, 1975

TECHNICAL STAFF	J.C. Kammerer, Editor-in-Chief H.D. Brice, Associate Editor T.H. Woodard J.K. Reid
COPY PREPARATION	L.C. Fleshmon, Chief S.L. Peterson M.C. Olson D.L. Radcliffe

EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for May based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for May 1975 is compared with flow for May in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for May is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being within the *normal range.* In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the May flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of May. Water level in each key observation well is compared with average level for the end of May determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels,* unless described otherwise, are from the end of April to the end of May.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. Issues of the Review are free on application to the Water Resources Review, U.S. Geological Survey, Reston, Virginia 22092.

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--RIO GRANDE REGION

The abstract and figure below are from the report, *Summary appraisals of the Nation's ground-water resources--Rio Grande Region*, by S.W. West and W.L. Broadhurst: U.S. Geological Survey Professional Paper 813-D, 39 pages, 1975. The report--a discussion of ground-water alternatives in water resources planning--may be purchased for $1.25 from Branch of Distribution, U.S. Geological Survey, 1200 South Eads St., Arlington, VA 22202 (check or money order payable to U.S. Geological Survey); or from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (GPO Stock Number 024-001-02626-1), payable to Superintendent of Documents.

ABSTRACT

Annual precipitation on the region is about 86 million acre-feet (110,000 hm^3); however, all but 4 million acre-feet (4,900 hm^3) is returned to the atmosphere by evapotranspiration. The ground-water reservoirs contain an aggregate of 5,800 million acre-feet (7,200,000 hm^3) of fresh and slightly saline water in storage, which could be withdrawn through wells. In contrast, the surface reservoirs have a combined storage capacity of only 18 million acre-feet (22,000 hm^3).

Thick deposits of valley fill in stream and intermontane valleys comprise the principal ground-water reservoirs. In most areas they are capable of yielding large supplies of water to wells. In some areas, limestone constitutes major aquifers.

The Rio Grande is an interstate and international stream which begins in high mountains of Colorado, flows across New Mexico, and forms the boundary between Texas and Mexico (fig. 1). Precipitation ranges from 8 inches (20 cm) to more than 30 inches (76 cm), but irrigation is required for growing crops throughout the region.

The population of the region has been increasing rapidly, from 750,000 in 1929 to 1,700,000 in 1970, and it is expected to increase to 2,500,000 by 2020. The basic economy of the region was agricultural until recent years. Since 1950, the mining and petroleum industries have increased much more rapidly than agriculture.

Withdrawal of ground water in the region in 1970 (fig. 1) was 2.7 million acre-feet (3,300 hm^3), of which 88 percent was used for irrigation. About 53 percent of the water withdrawn was consumed. Ground water has been "mined" in some areas, and severe declines in water levels have resulted.

The loss of water by evapotranspiration in wetlands and phreatophyte areas is 2.5 million acre-feet (3,100 hm^3) per year. In comparison, about 3.7 million acre-feet (4,600 hm^3) per year of surface water and ground water is consumed by man's activities.

Salvage of water lost to noneconomic evapotranspiration in wet and phreatophyte-infested areas offers the greatest possibility of improving the effective water supply in the region. Salvage of half the water lost would increase the effective supply by 1.2 million acre-feet (1,500 hm^3) per year. The usable water supply could be increased tremendously by drawing on the large reserve of ground water in storage, but this withdrawal could affect the flow of streams in some areas.

The region appears to offer several possibilities for utilizing underground space for purposes other than the withdrawal of water, such as waste disposal, artificial recharge, water-quality control, and development of geothermal energy.

Planners for ground-water management should have detailed information on the physical parameters that affect ground water, so improved management would be possible.

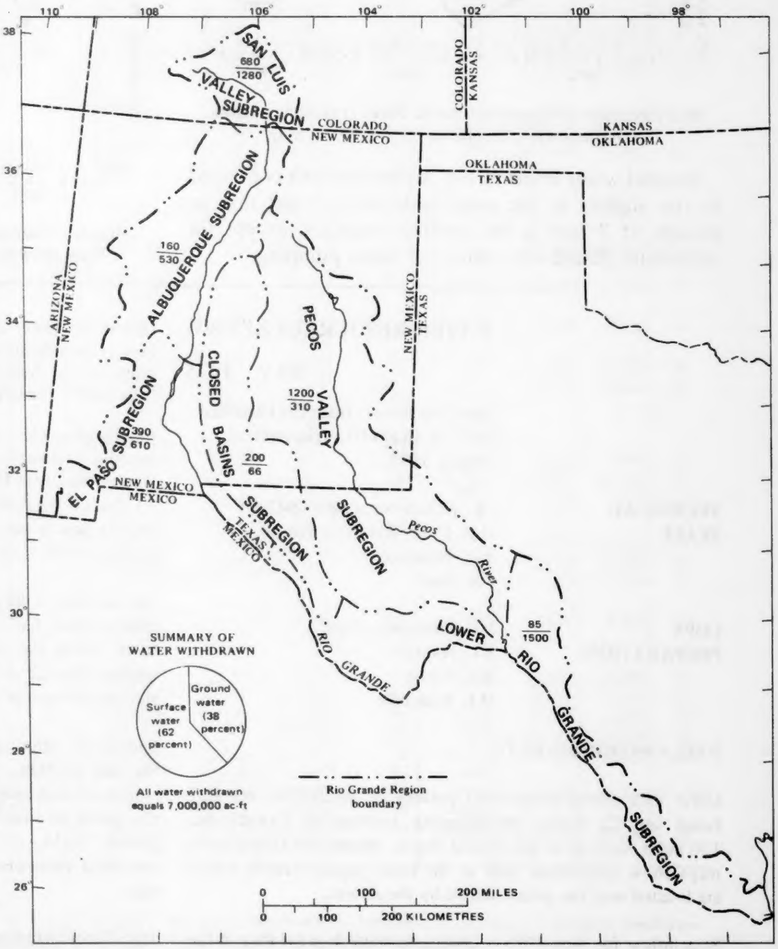


Figure 1.--Ratio between ground water withdrawn (upper number) and surface water withdrawn (lower number). The ratio varies widely from one subregion to another. Units are thousands of acre-feet.